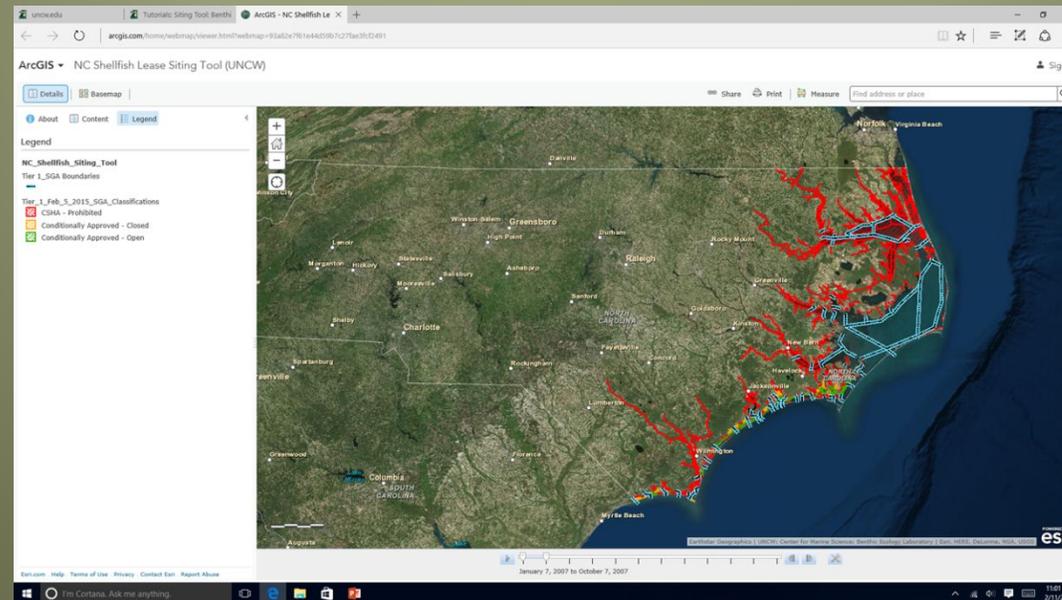


Using the North Carolina Shellfish Aquaculture Siting Tool

Troy D. Alphin and Martin Posey,

University of North Carolina Wilmington, Center for Marine Science



Today

- Creating the tool
 - Why use it?
- What is the tool?
 - Development
- Under development
- Case study for data tools



NC Shellfish Siting Tool

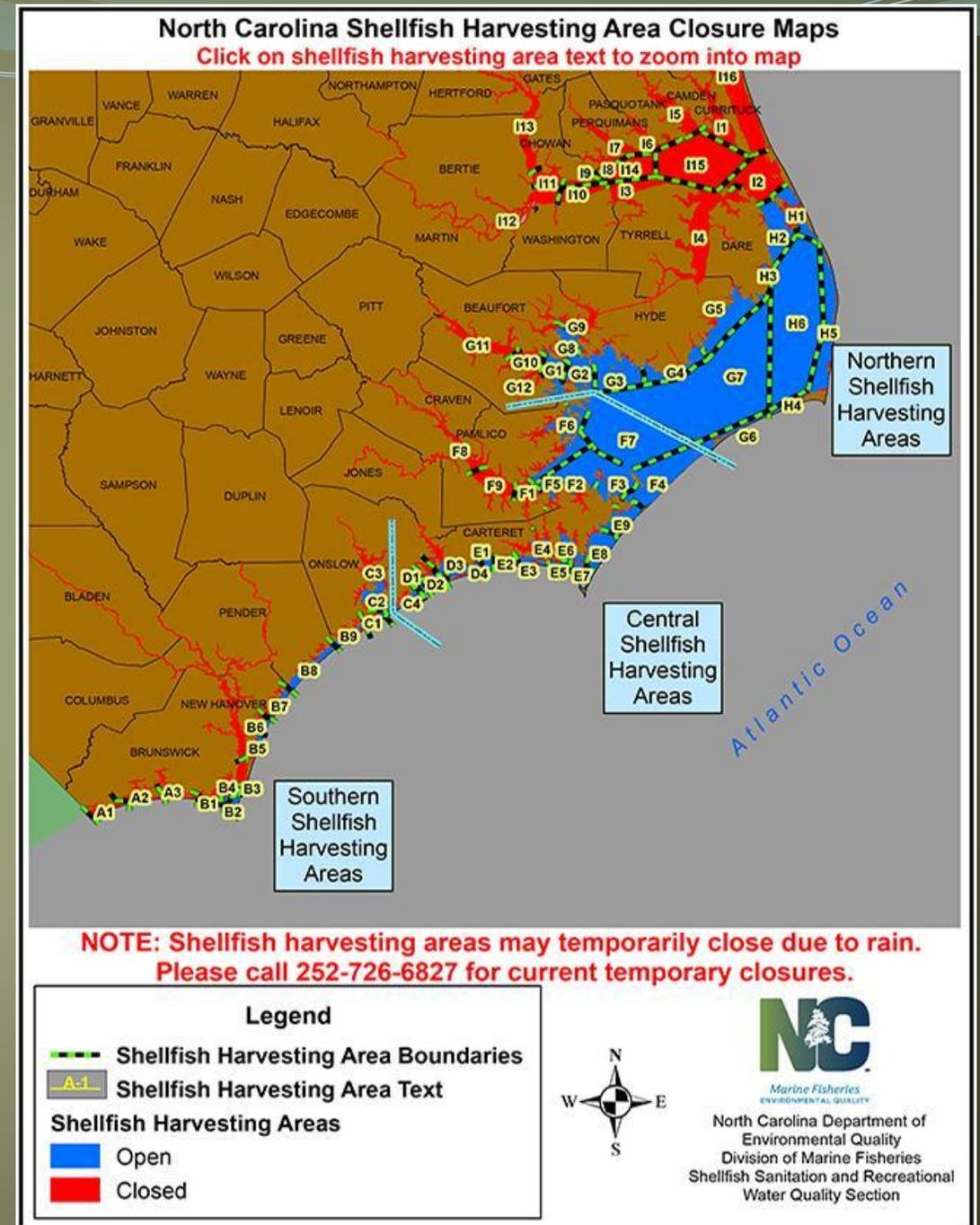
- Here we have developed an interactive online tool, specifically designed to help potential Shellfish growers with site selection for further investigation.
- Here we provide visualization of public datasets with the goal of reducing **user conflicts and regulatory demand**.
- <https://uncw.edu/benthic/sitingtool/>
- <http://portal.ncdenr.org/web/mf/shellfish-lease-franchise-programs>

Troy's Disclaimer "This is not a substitute for on site verification"



When we started

- Aquaculture needs to fill a greater portion of consumer demand
- Modeled off existing tools- UCONN Shellfish mapper <https://shellfish.uconn.edu/maps/>
- Guidance from
 - NCDMF
 - NC Sea Grant
 - NOAA
 - DCM
 - Growers- experienced and new
- Obstacles to the overall industry
 - Regulations (moving target)
 - Market factors
 - Perceived vs Real conflict
 - Siting of new operations



NC Grower's Concerned

- Water Quality
- Storms!
- **Human interactions!**
 - Not everyone agrees
 - Community Engagement
- **Locations**
- Others
 - Marketing
 - Distribution
 - Finance

North Carolina's Shellfish Industry: Site Conditions and Economic Impacts

A statewide survey of shellfish leaseholders



Marc J. Turano, North Carolina Sea Grant
Martin Posey, University of North Carolina Wilmington
Troy Alphin, University of North Carolina Wilmington

Utilize Environmental vs non-environmental**

Orthoimagery from NC Dept. of Agriculture and Consumer Services.

NC DENR

DMF

DCM

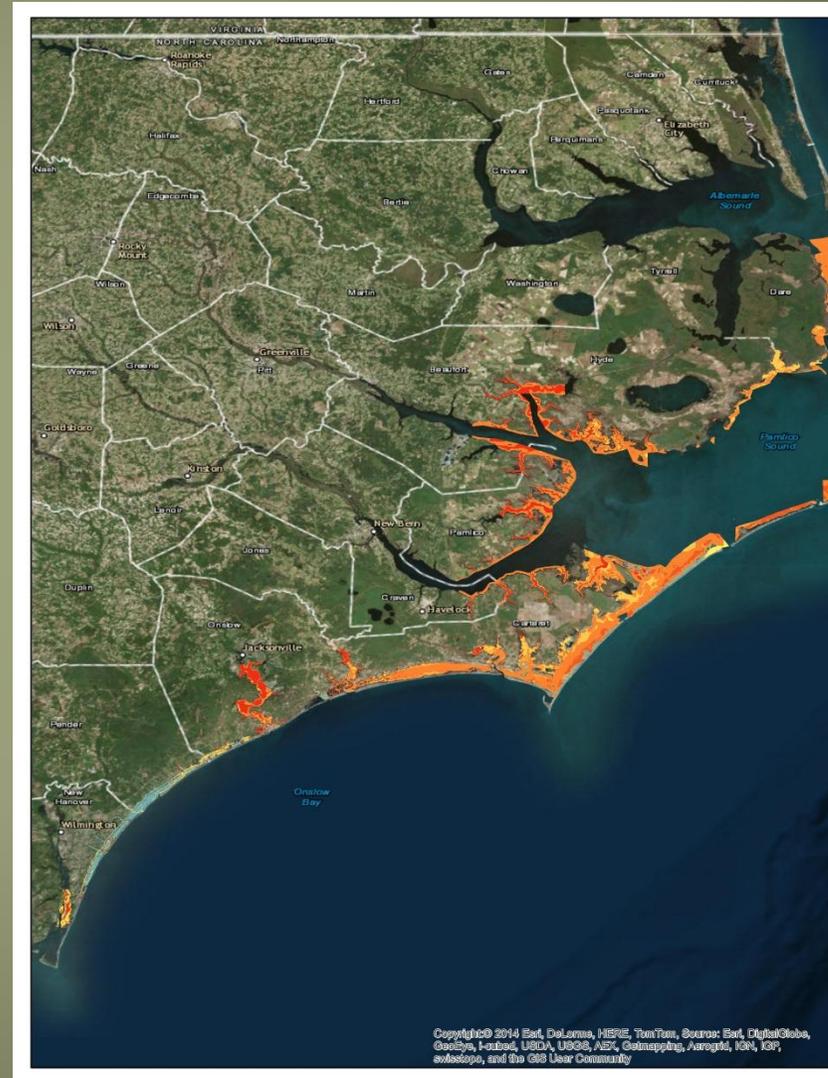
NOAA

Siting tool

1-3 thousand hits/month

~1000 unique hits

Many users not on the coast



How to Select New Areas

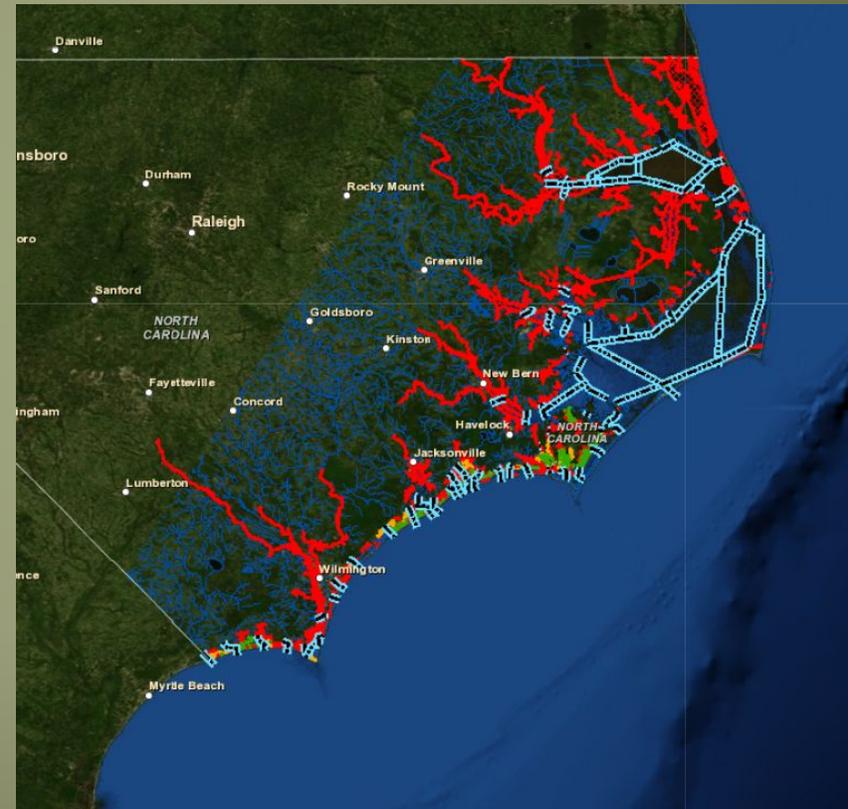
- New to the industry or new to the area
- Provides some info on classification and conditions
 - Always changing/ updating
- Provides mainly public information
 - Sometimes time from unintended uses
- For those that are familiar with your growing area historical data and metadata
 - Past might be a good predictor

Under Development

- Currently 22 layers available
- Data layers for risk factors- wind and storms, competing uses
- Decision Support tool- development in conjunction with NCDMF and stakeholders to help guide new growers through the process
- **“Developing Farm and Market tools for Shellfish Mariculture in North Carolina”- Starting 2021. Partnership with NC Sea Grant. Farm planning to business incubator for growers**

Before you get started

- Type of operation
 - Shell on bottom
 - Spat on shell
 - Floating bags
 - Bottom cages
- Effort you can commit
- How much area can you afford to work

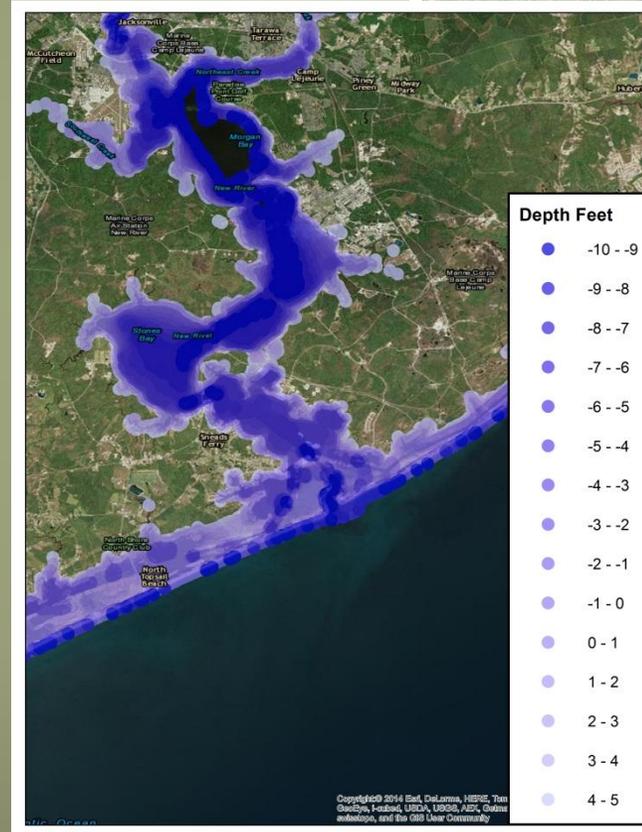
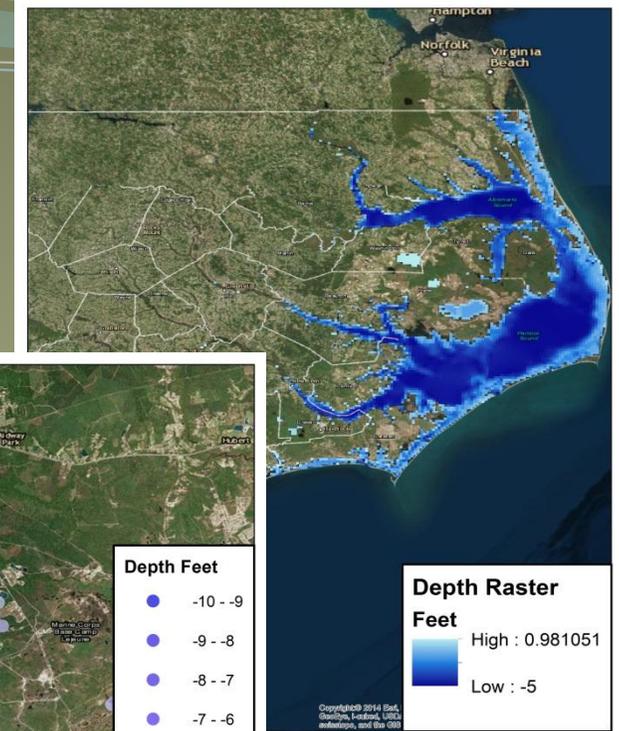


Classification Only



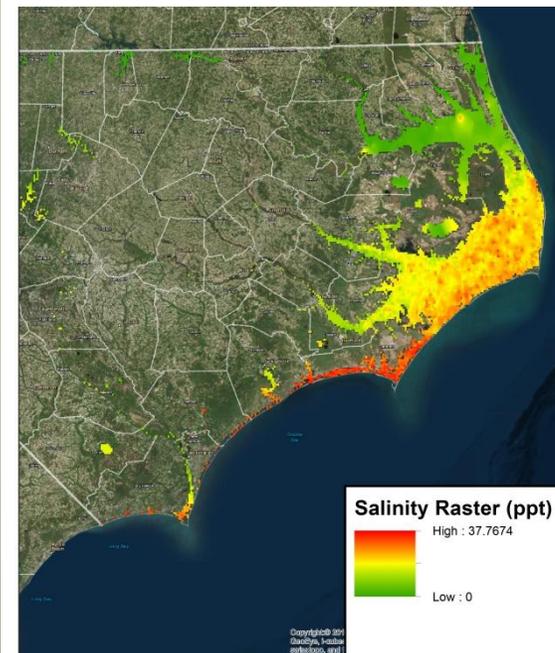
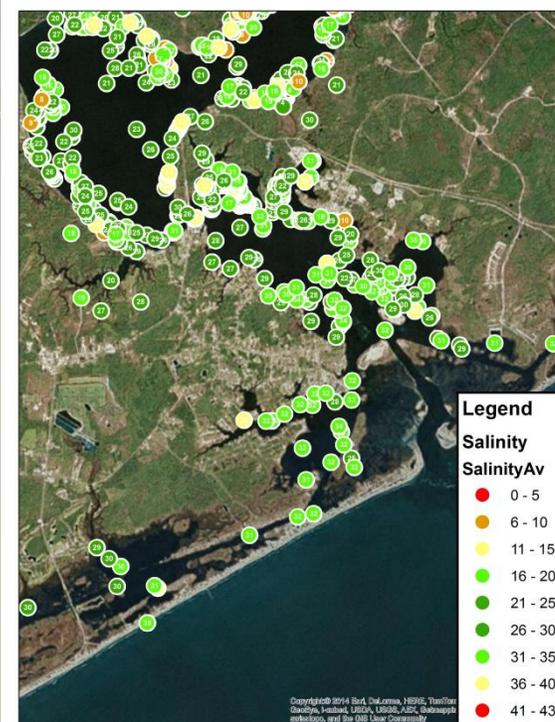
Depth Contour

- Multiple file types
- Differences in precision
- Clarity
- Raster data currently available



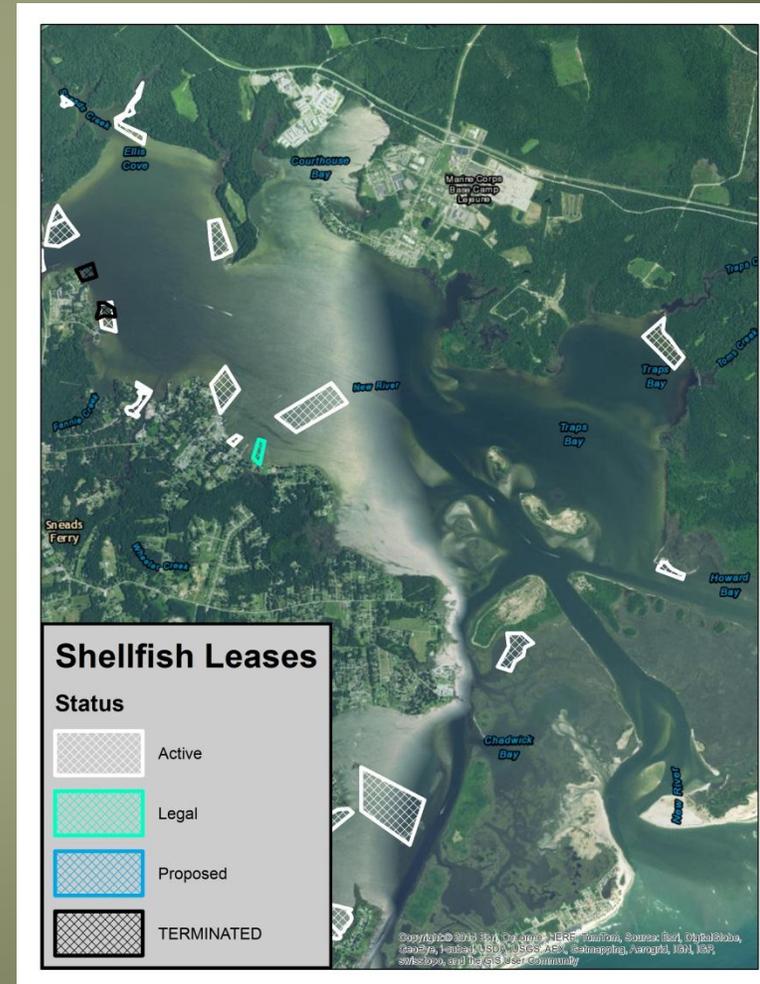
Salinity

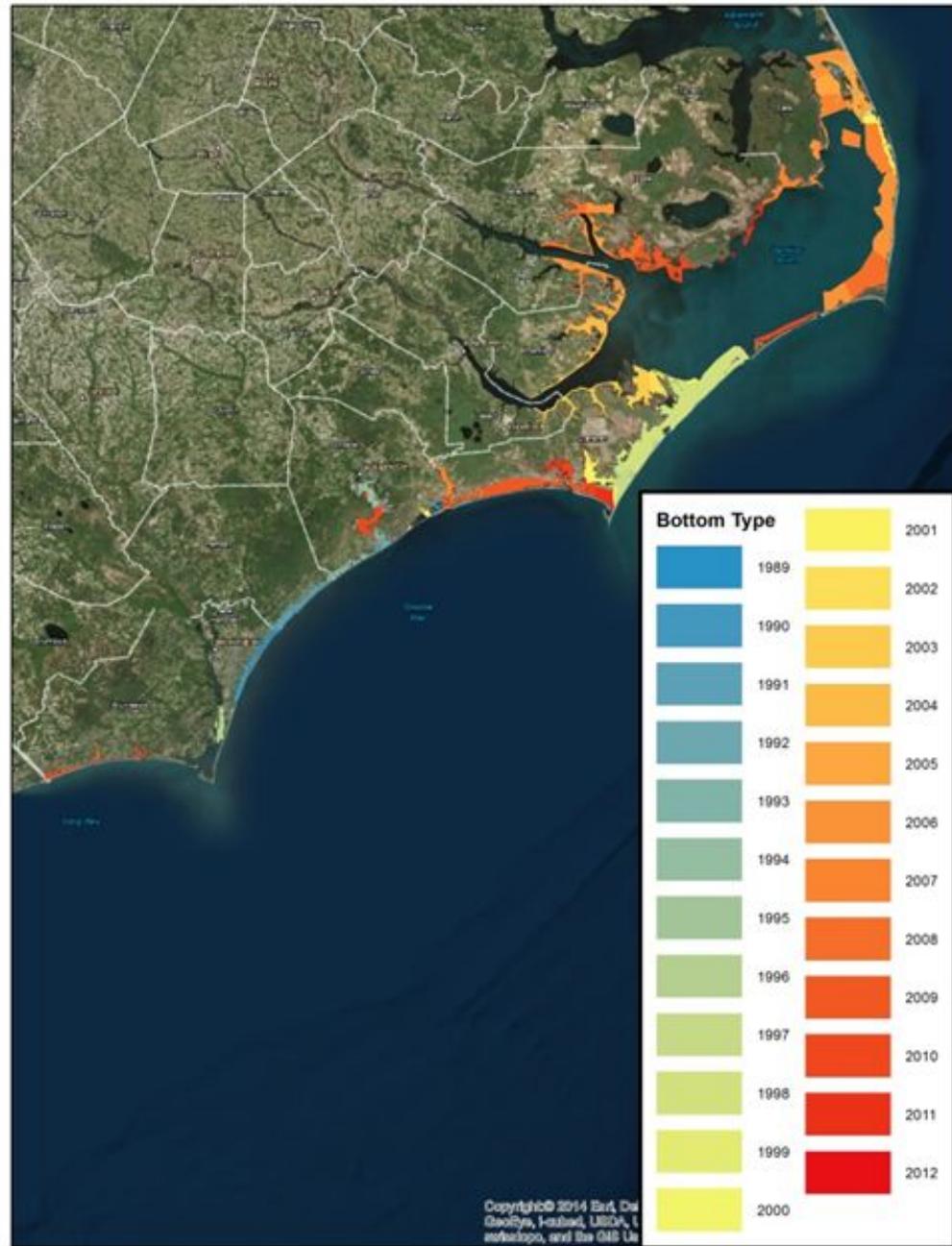
- No clear comprehensive data set
- Consistency
 - Missing metadata
- 5 yr mean (based on available data)
 - Min and Max
- Salinity Raster disappears when zoomed in at 1:300,000
- Salinity Point Data appears at 1:300,000



Existing Leases

- Only shows relative size and position
 - Acreage
- No identifier in dataset
- Lease vs Franchise
- New river leases***





How does it work

<http://uncw.edu/benthic/>

The screenshot shows a web browser window displaying the Benthic Ecology Laboratory website. The browser's address bar shows the URL <http://uncw.edu/benthic/>. The website header includes the UNCW logo and navigation links for Email, Directory, mySeaport, and Quicklinks. A search bar is also present. The main content area features a navigation menu on the left with links for Benthic Home, Research Personnel, NC Shellfish Lease Siting Tool, Research, Projects, Publications, Links, and Picture Archive. A large black arrow points to the 'Benthic Home' link. To the right of the menu is a large image of a marsh with tall grasses and water. Below the image is a 'Welcome' section with text about the laboratory's research focus. On the right side of the page, there is a 'CONTACT US' section with contact information for Troy Alphin and Martin Posey. The Windows taskbar at the bottom shows the time as 10:47 PM on 2/11/2016.

Contact Info and Tutorials

Tutorials

Contact information

UNCW UNIVERSITY OF NORTH CAROLINA WILMINGTON

The North Carolina Shellfish Siting Tool

Benthic Home

- Research Personnel
- NC Shellfish Lease Siting Tool
- About the Shellfish Industry
- Tutorials
- Layers
- Acknowledgements
- Research
- Projects
- Publications
- Links
- Picture Archive

The North Carolina Shellfish Siting Tool

This tool, created and maintained by the University of North Carolina Wilmington (UNCW), is an interactive decision-support tool for the North Carolina coastline that will assist new or current growers in siting new or expanding shellfish operations by providing a simple tool to assess conditions based on existing datasets. The tool is designed to provide information to help potential shellfish growers determine site feasibility and help them identify potential risks and long-term suitability for particular areas. This project is a data visualization tool providing information on data specifically related to shellfish aquaculture including salinity, bottom type, depth soundings, shellfish growing area classifications, boat access areas, surrounding land cover and current shellfish growing operations.

Project Objectives

Promote shellfish aquaculture and expand the industry in North Carolina by:

- ◆ Increase access to, and knowledge of, publically available datasets.
- ◆ Reduce time involved in selecting an aquaculture site location.
- ◆ Help streamline the shellfish bottom lease site selection process by providing an overview of likely sites in a shellfish growing area.

Project Background

CONTACT US

Troy Alphin
Title: Senior Research Associate
E-mail: alaphin@uncw.edu
Phone: (910) 962-2395
Fax: (910) 962-2410

Martin Posey
Title: Associate Vice Chancellor and Dean of Undergraduate Studies
E-mail: posevm@uncw.edu
Phone: (910) 962-3610
Website: www.uncw.edu/bio/faculty_posev.html

Megan Rudolf
Title: Research Technician
E-mail: rudoim@uncw.edu
Phone: (910) 962-2325
Fax: (910) 962-2410

Our Mailing Address

Benthic Ecology Laboratory
UNCW Center for Marine Science
5600 Marvin K. Moss Lane
Wilmington, NC 28409

IMPORTANT LINKS

[Shellfish Lease and Franchise Program](#)

[NC Shellfish Lease Application](#)

[NC Shellfish Industry Report \(2009-2011\) \(PDF\)](#)

Select Tutorial or Get Started

The screenshot shows a web browser window displaying the UNCW Benthic Ecology Laboratory website. The page features a navigation menu on the left with categories like 'Benthic Home', 'Research Personnel', 'NC Shellfish Lease Siting Tool', 'Research', 'Projects', 'Publications', 'Links', and 'Picture Archive'. The main content area is titled 'Tutorials' and includes sections for 'How to Use the NC Shellfish Siting Tool' and 'Details of the Layers'. A sidebar on the right is titled 'THE SITING MAP TOOL' and contains links for 'Siting Tool Layers', 'IMPORTANT LINKS', and various reports and maps. A red arrow points to the 'THE SITING MAP TOOL' section.

uncw.edu | Tutorials: Siting Tool: Be | uncw.edu/benthic/sitingtool/tutorials.html

UNCW UNIVERSITY of NORTH CAROLINA WILMINGTON

Email | Directory | mySeaport | Quicklinks

Search UNCW Go

Benthic Ecology Laboratory

Benthic Home

Research Personnel

NC Shellfish Lease Siting Tool

- About the Shellfish Industry
- Tutorials
- Layers
- Acknowledgements
- Siting Tool Map

Research

Projects

Publications

Links

Picture Archive

Tutorials

These are tutorials on how to use the online NC Shellfish Siting Tool, details of the layers, and the background of the project.

How to Use the NC Shellfish Siting Tool

This video shows step-by-step how to navigate the online map and its functions.

The functions include:

- ~ Expanding the legend
- ~ Turning on and off layers
- ~ Zooming into areas of the map
- ~ Measuring areas and distances
- ~ GPS coordinates of locations
- ~ Search and Query options

To zoom out from a specific area of the map, left click the "x" at the upper corner of the map.

Details of the Layers

This video shows an in-depth review of the layers including viewing the time enabled data of the SGA Classification layer.

The time slider will automatically move and display the classification changes on the map.

THE SITING MAP TOOL

Siting Tool Layers

IMPORTANT LINKS

- [Shellfish Lease and Franchise Program](#)
- [NC Shellfish Lease Application](#)
- [NC Shellfish Industry Report \(2009-2011\) \(PDF\)](#)
- [NC Shellfish Sanitation](#)
- [NC Shellfish Closure Maps](#)
- [NC Shellfish Closure Proclamations](#)

← The Map Tool

I'm Cortana. Ask me anything.

10:58 PM 2/11/2016

The Starting Map

The screenshot displays a web browser window with the URL `arcgis.com/home/webmap/viewer.html?webmap=93a82e7f61e44d59b7c27fae3f2491`. The page title is "ArcGIS - NC Shellfish Lease Siting Tool (UNCW)". The interface includes a top navigation bar with "Details" and "Map" buttons, a search bar, and a "Sign In" link. A green arrow points to the "Details" button.

The left sidebar contains a "Legend" section for the "NC_Shellfish_Siting_Tool". The legend items are:

- Tier 1_SGA Boundaries
- Tier 1_Feb_5_2015_SGA_Classifications
 - CSHA - Prohibited
 - Conditionally Approved - Closed
 - Conditionally Approved - Open

The main map area shows a satellite view of North Carolina with various colored overlays representing shellfish lease boundaries and classifications. Major cities like Charlotte, Raleigh, and Greensboro are labeled. The map includes navigation controls (zoom in, zoom out, home, full screen) and a scale bar. The bottom of the map shows the date range "January 7, 2007 to October 7, 2007". The Esri logo and "POWERED BY" text are visible in the bottom right corner.

Reveal the Layers

The screenshot displays the ArcGIS web interface for the 'NC Shellfish Lease Siting Tool (UNCW)'. The browser address bar shows the URL: `arcgis.com/home/webmap/viewer.html?webmap=93a82e7f61e44d59b7c27fae3fct2491`. The interface includes a search bar, navigation tools, and a 'Contents' panel on the left. The 'Contents' panel lists the following layers:

- NC Shellfish Siting Tool
- Orthoimag
- Imagery with L

A green arrow points to the 'NC Shellfish Siting Tool' layer. The map shows a satellite view of North Carolina with red and blue lines indicating shellfish siting tool boundaries. The map includes labels for major cities like Danville, Greensboro, Durham, Raleigh, and Charlotte. The bottom of the screen shows the Windows taskbar with the time 11:04 PM on 2/11/2016.

uncw.edu | Tutorials: Siting Tool: Benthic | ArcGIS - NC Shellfish Le... | arcgis.com/home/webmap/viewer.html?webmap=93a82e7f61e44d59b7c27fae3fcf2491

ArcGIS - NC Shellfish Lease Siting Tool (UNCW)

Share | Print | Measure | Find address or place

About | Content | Legend

Contents

- NC Shellfish Siting Tool
 - Tier 1 2007-2015 Salinity, Water, Air, and Rain
 - Tier 1 SGA Boundaries
 - Tier 1 Shellfish Leases
 - Tier 1 Feb 5 2015 SGA Classifications
 - Tier 1 2007-2015 SGA Classifications
 - Tier 1 NC Depths (feet)
 - Tier 2 Boating Access Areas
 - Tier 2 Artificial Reefs
 - Tier 2 Rivers and Streams
 - Tier 2 Submerged Aquatic Vegetation
 - Tier 2 Fishing Nursery Areas
 - Tier 2 Bottom Type
 - Tier 2 Lands Managed
 - Tier 2 NC Land Cover
 - Orthoimagery 2012
 - Imagery with Labels

January 7, 2007 to October 7, 2007

Esri.com | Help | Terms of Use | Privacy | Contact Esri | Report Abuse

POWERED BY esri

Focus on Target area

The screenshot shows an ArcGIS web application interface. The browser address bar displays the URL: `arcgis.com/home/webmap/viewer.html?webmap=93a82e7f61e44d59b7c27fae3fcf2491`. The page title is "ArcGIS - NC Shellfish Lease Siting Tool (UNCW)".

The interface includes a "Contents" panel on the left with the following items:

- NC Shellfish Siting Tool
 - Tier 1 2007-2015 Salinity, Water, Air, and Rain
 - Tier 1 SGA Boundaries
 - Tier 1 Shellfish Leases
 - Tier 1 Feb 5 2015 SGA Classifications
 - Tier 1 2007-2015 SGA Classifications
 - CSHA - Prohibited
 - Conditionally Approved - Closed
 - Conditionally Approved - Open
 - Tier 1 NC Depths (feet)
 - Tier 2 Boating Access Areas
 - Tier 2 Artificial Reefs
 - Tier 2 Rivers and Streams
 - Tier 2 Submerged Aquatic Vegetation
 - Tier 2 Fishing Nursery Areas
 - Tier 2 Bottom Type
 - Tier 2 Lands Managed
 - Tier 2 NC Land Cover
- Orthoimagery 2012

The map displays a coastal area with various colored overlays. A green arrow points to the "Tier 1 2007-2015 SGA Classifications" legend item. The map shows a large area of red (CSHA - Prohibited) and green (Conditionally Approved - Open) areas. Labels on the map include "Sneads Ferry", "Woods", "Howard Bay", "Mummeck Bay", "Alligator Bay", "Pond Creek", "Cherokee Bay", and "New River".

The bottom of the interface shows a timeline from "January 7, 2007 to October 7, 2007" and a status bar with the text "I'm Cortana. Ask me anything." and the system clock "11:11 PM 2/11/2016".

Turn on as Many Layers as Needed

The screenshot shows the ArcGIS web application interface for the "NC Shellfish Lease Siting Tool (UNCW)". The browser address bar shows the URL: `arcgis.com/home/webmap/viewer.html?webmap=93a82e7f61e44d59b7c27fae3fcf2491`. The application title is "ArcGIS - NC Shellfish Lease Siting Tool (UNCW)".

The interface includes a "Contents" panel on the left with the following layers and sub-layers:

- NC Shellfish Siting Tool
 - Tier 1 2007-2015 Salinity, Water, Air, and Rain
 - Tier 1 SGA Boundaries
 - Tier 1 Shellfish Leases
 - Active
 - Legal
 - Proposed
 - TERMINATED
 - Tier 1 Feb 5 2015 SGA Classifications
 - Tier 1 2007-2015 SGA Classifications
 - CSHA - Prohibited
 - Conditionally Approved - Closed
 - Conditionally Approved - Open
 - Tier 1 NC Depths (feet)
 - Tier 2 Boating Access Areas
 - Tier 2 Artificial Reefs
 - Tier 2 Rivers and Streams
 - Tier 2 Submerged Aquatic Vegetation
 - Tier 2 Fishing Nursery Areas
 - Tier 2 Bottom Type
 - Tier 2 Lands Managed

The map displays a coastal area with various layers overlaid. The map shows a mix of red areas (prohibited), green areas (conditionally approved), and blue areas (depths). The map includes labels for "Sneads Ferry", "Woods", "Howard Bay", "Mumme's Bay", "Alligator Bay", and "Charlotte Bay". The map also shows a "North Carolina Coastal Club" and a "New River".

The bottom of the map shows a timeline from "January 7, 2007 to October 7, 2007". The bottom right corner of the map area includes the text "POWERED BY esri" and "USDA FSA, Microsoft | UNCW/ Center for Marine Science; Benthic Ecology Laboratory | State of North Carolina DOT, Esri, HERE,..."

The Windows taskbar at the bottom shows the system tray with the time "11:13 PM" and date "2/11/2016".

Information on Data Source

The screenshot shows a web browser window displaying the ArcGIS REST Services Directory for a specific layer. The browser's address bar shows the URL: 152.20.242.41/arcgis/rest/services/NCsitingTool/NC_Shellfish_Siting_Tool/MapServer/9. The page title is 'ArcGIS REST Services Directory' and the breadcrumb navigation is 'Home > services > NCSitingTool > NC_Shellfish_Siting_Tool (MapServer) > Tier 2_Submerged Aquatic Vegetation'. There are links for 'JSON', 'Help', and 'API Reference'. The main content area provides detailed metadata for the layer 'Tier 2_Submerged Aquatic Vegetation (ID: 9)'. The metadata includes the layer name, name, display field, type, geometry type, description, definition expression, copyright text, default visibility, max record count, supported query formats, min and max scale, supported advanced queries, supported statistics, has labels, can modify layer, can scale symbols, use standardized queries, and extent coordinates.

ArcGIS REST Services Directory [Login](#)

[Home](#) > [services](#) > [NCSitingTool](#) > [NC_Shellfish_Siting_Tool \(MapServer\)](#) > [Tier 2_Submerged Aquatic Vegetation](#) [Help](#) | [API Reference](#)

[JSON](#)

Layer: Tier 2_Submerged Aquatic Vegetation (ID: 9)

Name: Tier 2_Submerged Aquatic Vegetation

Display Field: Class

Type: Feature Layer

Geometry Type: esriGeometryPolygon

Description: Layer Name: Tier 2_Submerged Aquatic Vegetation File Name: Tier_2_Submerged_Aquatic_Vegetation.shp Layer File Source: The_Map_2015_Jan Layer Source Organization: NC One Map, NC DENR Layer Contact: Anne Deaton anne.deaton@ncdenr.gov Date Taken: August 2011 Date Updated: Horizontal Datum: NAD_1983_StatePlane_North_Carolina_FIPS_3200_Feet Scale/Measurement Reference: Scale Range: No Scale Range: Don't show layer when zoomed: Out beyond: Layer Symbology: Category – Unique values – Value Field: Class Symbol: (solid fill) – Colors: Ginger Pink (DENSE), Rhodolite Rose (PATCHY) Labels: No Label Field: Label Scale Range: Don't show layer when zoomed: Out beyond: Label Symbology: Alterations/Other Information: Clipped file so only areas nearshore and inshore are displayed for coastal North Carolina. Removed 'aquaculture', 'Dense_I', and 'Patchy_I' from class field. Dense = 70%< coverage Patchy = 10%-70% coverage

Definition Expression: N/A

Copyright Text:

Default Visibility: false

MaxRecordCount: 1000

Supported Query Formats: JSON, AMF

Min Scale: 0

Max Scale: 0

Supports Advanced Queries: false

Supports Statistics: false

Has Labels: false

Can Modify Layer: false

Can Scale Symbols: false

Use Standardized Queries: true

Extent:

XMin: 659303.0130999982
YMin: 13507.672899998724
XMax: 929591.2920000032
YMax: 332770.27380000055
Spatial Reference: 32119 (32119)

Explore Information cont'd

arcgis.com/home/webmap/viewer.html?webmap=93a82e7f61e44d59b7c27fae3f2491

ArcGIS - NC Shellfish Lease Siting Tool (UNCW)

Details | Basemap

Share | Print | Measure | Find address or place

About | Content | Legend

Contents

- NC Shellfish Siting Tool
 - Tier 1 2007-2015 Salinity, Water, Air, and Rain
 - 0.0 - 5.0
 - 5.1 - 10.0
 - 10.1 - 15.0
 - 15.1 - 20.0
 - 20.1 - 25.0
 - 25.1 - 30.0
 - 30.1 - 35.0
 - 35.1 - 40.0
 - 40.1 - 45.0
 - Tier 1 SGA Boundaries
 - Tier 1 Shellfish Leases
 - Tier 1 Feb 5 2015 SGA Classifications
 - CSHA - Prohibited
 - Conditionally Approved - Closed
 - Conditionally Approved - Open
 - Tier 1 2007-2015 SGA Classifications
 - Tier 1 NC Depths (feet)
 - Tier 2 Boating Access Areas
 - Tier 2 Artificial Reefs
 - Tier 2 Rivers and Streams
 - Tier 2 Submerged Aquatic Vegetation
 - Tier 2 Fishhinn Nursery Areas

Tier 1 2007-2013 Salinity, Water, Air, and Rain:

Property	Value
LAT_DD	
LONG_DD	
STA_CODE	
ActiveYears	
Salinity_#_of_Samples	47
SalinityAverage	32.40
SalinityMinimum	18.00
SalinityMaximum	39.00
H2OTemp_#_of_Samples	47
H2OTempAverage	
H2OTempMinimum	
H2OTempMaximum	
Zoom to	

January 7, 2007 to October 7, 2007

USDA FSA, Microsoft | UNCW/ Center for Marine Science; Benthic Ecology Laboratory | State of North Carolina DOT, Esri, HERE,...

POWERED BY esri

11:22 PM 2/11/2016

Acknowledgements

- Megan Rudolf- Site Manager
- Sharon Tatem- Data Manager
- Parker Moran - UNCW Operations and Systems Administration
- Tony Copeland - UNCW Operations and Systems Administration
- Dr. Joanne Halls - UNCW Dept. of Geography and Geology
- Xiaoyan Qi - UNCW
- Carey Jenkins - ROK Global Applications Group, LLC
- Jason Harris - ROK Technologies
- Jason Rogers - CFCC Marine Technology Department
- Tim Shaw – CFCC Marine Technology Department
- Sharon Tatem (SOSM Project)
- Layla Kashlan (Army Corp)
- Dr. Rick Luettich (UNC)
- Anna Stefanowicz (NC WRC)
- Jeff Brown (NCCGIA)
- John Finnegan (NCCGIA)
- NOAA Coastal Services Center
- Richard Vandersnick (Senior Geomatics Analyst, SGT, Inc.)



Questions?

